GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER– V(OLD) EXAMINATION – SUMMER 2019

Subject Code:151903   Date:31/05/2019
Subject Name:Fluid Power Engineering
Time:02:30 PM TO 05:00 PM   Total Marks: 70

Instructions:
1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

Q.1	**(a)**	Derive an expression of power transmission through pipe. Also find condition for maximum power transmission and corresponding efficiency of transmission.	**07**
	(b)	Derive Darcy- Weisbach formula for head loss due to friction in pipe flow.	**07**
Q.2	**(a)**	Show that the efficiency of a free jet striking normally on a series of flat plates mounted on the periphery of a wheel can never exceed 50%.	**07**
	(b)	Write brief note on hydraulic ram.	**07**

OR

	(b)	Prove that the efficiency of propulsion when the inlet orifices face the direction of motion of the ship is given by $$\eta = \frac{2u}{V + 2u}$$	**07**

Q.3	**(a)**	What is degree of reaction? Prove that for Francis turbine degree of reaction is 50%.	**07**
	(b)	The following data relates to a Pelton wheel turbine (i) Head of base of nozzle=75m (ii) speed of the wheel = 250 rpm (iii) speed ratio =0.46 (iv) Power at the shaft=120 kw (v) Coefficient of velocity = 0.98 (vi) Overall efficiency =86%. Design the Pelton wheel to find the wheel diameter, diameter of jet, size of buckets and number of buckets on the wheel.	**07**

OR

Q.3	**(a)**	Write short note on: (i) Priming in centrifugal pump (ii) Pre-whirl in centrifugal compressor	**07**
	(b)	Explain the governing of Kaplan turbine with neat sketch.	**07**
Q.4	**(a)**	Define specific speed of pump. Derive an expression for specific speed for centrifugal Pump.	**07**
	(b)	A single acting reciprocating pump, running at 60 rpm delivers 0.54 m³ of water per minute. The diameter of the piston is 200mm and stroke length 300mm. the suction and delivery heads are 4m and 12m respectively. Determine: (i) Theoretical discharge, (ii) co-efficient of discharge, (iii) percentage slip of pump, (iv) power required to drive the pump.	**07**

OR

Q.4	**(a)**	Derive an expression of work done per cycle for reciprocating compressor by considering clearance volume.	**07**
	(b)	A centrifugal compressor delivers 16 kg/sec of air with a total head pressure ratio of 4:1, when running at 15000 rpm. Inlet total head temperature is 25^0C, slip factor 0.9, power input factor 1.04 and isentropic efficiency 82%, calculate: (i) Outlet diameter of the impeller, (ii) Power input. Take C_p = 1.005 kJ/kgK.	**07**

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Q.5 **(a)** With neat sketch explain construction and working of hydraulic intensifier   **07**
    (b) Explain following terms: Draftube, Cavitation and Air vessel   **07**

<div align="center">OR</div>

Q.5 **(a)** With neat sketch explain construction and working of hydraulic intensifier   **07**
    (b) Explain the phenomenon of surging and stalling in an axial flow compressor   **07**

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